3/00

Dear Jim,

Your 2/16/00 letter was a delightful surprise To answer your questions will bring back many fond memories.

I was working as Director of Electronics Research at Kearfott Guidance in Little Falls New Jersey in 1961. I had a Ph.D. in physics and had an extensive background in missile telemetry and solid state. A cohort of mine was Irv Leiberman who had been hired to develop a guidance computer for missiles and aircraft that he had dreamed up. Irv was a genius with very advanced ideas on structure and organization of computers. We became friends and one day he hinted that he had an idea for a mechanical computer that worked by having marbles roll through gates. Meanwhile my wife and I had befriended a young man from Tulsa who was starting at Stevens Institute in mechanical engineering. We had an old house in Montclair with a bedroom and bath on the third floor, so we took him in with us. He was Dave Hogan. Well I finally got Irv to reveal how he was going to make his computer and it appeared very impractical to me. With Irv's permission I discussed it with Dave and he agreed with me. After many brainstorming sessions we came up with the idea of using mechanical planes as the connections and clock and pivoting rods interrupted by tabs to form the binary functions. The first digicomp was made of six circular planes with the rods positioned all around. And it worked so well that we got a booth and demonstrated it at the Annual March Toy Fair held in NYC . But with all those planes and gates (the unit was about a foot in diameter) we seemed to scare off most buyers even though they were intrigued with the concept. Well along came a buyer from Sears &Roebuck who said he would love to put it his catalog but couldn't we make it simpler, perhaps just a section of the unit. Wow!! We went home and that night worked through, first brain storming (Irv was upset because he felt a small unit could not handle many programs, but when pressed he agreed that he could think some neat ones. The next day we cut up that stiff compressed paper stuff and literally created the first Digicomp in almost hours. (by the way, Dave had found a source for Orthodontist rubber bands that he used for the springs!!) We brought it back to the show and the Sears Buyer agreed that as soon as we had a production model he would put it in his catalogue

We fortunately found a chap who was brilliant at designing plastic injection molds so we gave him the contract Of course Dave worked with him closely and after several months we had our first samples of the Digicomp parts. Dave also engineered the rods and eventually the wire springs so that they could be mass produced

In the meantime we formed ESR which stood for Electronic Systems Research but couldn't find a name that wasn't already taken so our attorney suggested using just the initials, developed the games and the manuals, raised money by going public ourselves (most people don't know it but you can do it yourself. In fact we found out that the SEC attorneys who judge the prospectus will help you if you ask for it!!). rented a facility and got ready for production. The sales from the digicomp catalog exceeded our expectations. We had many exciting moments such as when Macy's sold out within hours after putting the Digicomp boxes out at Christmas.

Another thing we did was to tell our bosses at Kearfott what we were doing and get them to agree in writing that we were not in competition with them. It was fun to be walking down the hall and have the president ask how sales were going!!

We had suggested in the first manual that we would welcome suggestions for additional programs that Digicomp could handle and the response was fantastic. We got programs from adults and many from children. I remember several that a nine year old boy sent from Tulsa that showed a very keen mind. And this response justified our belief that one of the things our Digicomp was doing was to stimulate the interest and minds of the users. the result of this response was that Dave, who had been taking advanced courses at Stevens wrote the additional manual which developed the programs in Boolean algebra, Venn diagrams, truth tables, etc. And we also published many of the user submitted programs in another manual.

Another exciting event was the day that Stacy Jones published our Digicomp as the patent of the week on the front page of the second section of The New York Times, which he did each in each Saturday edition. A few weeks later he called to tell us that the response to our Digicomp was by far the greatest he had ever had to any patent of the week! I've enclosed a copy of his review. I've also included a copy of an article in the New Sunday News.

I am very sorry to say that Dave passed away two years ago. We still keep in touch with his widow out in Arizona.

It was also pleasing to read the article in Creative Computing of 1984 arguing that our Digicomp was the first true home computer. I've enclosed a copy of that article also.

To continue, a short time after Digicomp was on the market, My wife and I were interrupted at our meal at a restaurant (we had left our number with the baby sitter) by the waiter saying there was a call for me. It was John Godfrey, an engineer with GE in Schenectady. John said he was so excited after getting Digicomp to find some people who might understand his inventions, Dr. Nim and, later called, Digicomp 11. Of course we invited him down to our plant in Jersey and immediately saw the possibilities. Dave was able to design Dr. Nim for plastic molding and it was put on the market. John also had a model of 11 which involved marbles rolling through gates in the same manner as Dr. Nim.. He and Dave built enough models and developed a manual which was tried out in the local school system. but getting the teachers to be able to understand it sufficiently was the problem. So Digi 11 languished unfortunately. John Godfrey lives just below me in Punta Gorda at 941-637-0532. His e-mail is jackg@sunline.net. I called him immediately after receiving your letter and he was as excited as I was. Incidentally, as a result of his contacts through ESR, John was set up in an on-line business which calculated the required mix of additives of a blast furnace to turn out the optimum desired steel. He set the company which he named On-Line Systems in Pittsburg. It was eminently successful and eventually sold to MCI making John rather wealthy.

About the same time John called, another chap, Joe Weisbecker called for the same reason. He was working for RCA in the Princeton area and had invented a mechanical computer that also used marbles. We had him come up and fell in love with it and named it Think-a-Dot. Again Dave redesigned it for plastic injection molding and we put it on the market. I had a chap working for me at Kearfott who had a thirteen year old genius for a son. We sent him a Think-a Dot and a few days later he came back with the advice that this was an octal based machine. So we included this in the manual that you see today. In time, two Ph.D. theses, one in Australia and one at Columbia used Think-a-Dot for part of the development. Needless to say, we were all very pleased to see what an impact our ideas had on the technical community.. I lost touch with Joe many years ago so I don't know whether he is still with us.

Eventually sales of the computers dropped off. Let's face it, we were quite a bit ahead of the times. We were able to purchase a Long Island Co., Educards Inc and there we developed a group of educational games that had reasonable market acceptance. This drew the attention of Binney and Smith, the makers of Crayola crayons and they purchased ESR for stock. So all the original investors made out reasonably well when later on Binney was purchased for cash. But Binney never put the computers back on the market. I eventually went back to Kearfott and retired from there in 1993. Dave went to Arizona and set up a very successful resort which his wife runs today. Irv dropped out of sight over 25 years ago when he tried to set up a recording business in California. Dave and I were unable to find him after that.

I gave each of my three children a sample of the three computers and I also have a sampling plus some extra Think-a-Dots. I gave John the Digi e-mail address so you may have already heard that he has a models of Digi11 as well as some manuals and further thoughts on the operation of Think-a-Dot.

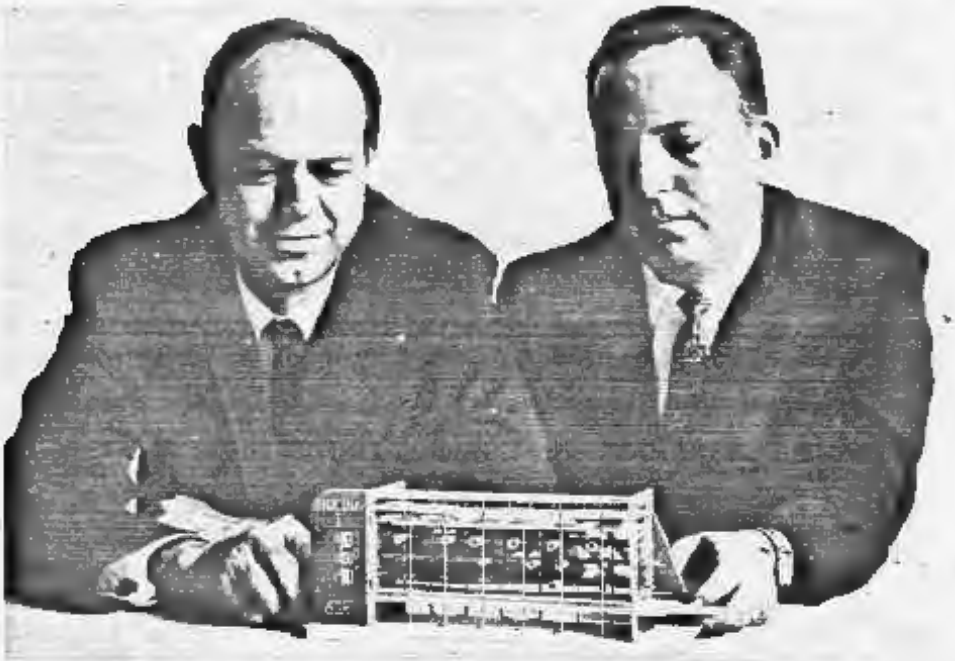
Well that's a brief history and status of our work. It's been fun resurrecting it from my ever failing memory. Don't hesitate to call me or John or write for any other questions you may have.

Thanks for your interest.

Bill

The New York Times says

SATURDAY, SEPTEMBER 24, 1966.



Dr. William H. Duerig, left, and C. David Hogan, two of three inventors, with Digicomp.

Tiny Computer Finds Home in School

By STACY V. JONES

Special to The New York Times

WASHINGTON, Sept. 23 — A little computer that was patented this week has produced a volume figure that is highly gratifying to its inventors.

Sales of the toy trainer — to school teachers, students and parents — passed 100,000 units, while the patent was still pending.

The three engineers, who were granted patent 3,273,794, believe that their device is the first mechanical, binary, digital computer.

Digicomp, as it is trademarked, is a foot long, made of plastic, and retails for less than $6.

As all the parts are open to view and touch, the student not only operates the machine but sees what happens.

The machine is described as capable of adding, subtracting, multiplying, counting down as if for a space launching, and answering riddles. It has the mechanical counterparts of the electronic computer's flip-flops, "and" gates and "or" gates.

Like its big brothers, Digicomp can be programed.

Dr. William H. Duerig and Irving J. Lieberman had the original idea, and enlisted C. David Hogan, then a student at Stevens Institute of Technology. In 1963, while he was still a junior, they applied for the patent and promoted the computer through their company, E.S.R., Inc., of Montclair, N. J.

Mr. Hogan, 27, is now the general manager of E.S.R. He said this week that many high school projects used Digicomp, which operates in the binary system that is part of the "new math." The educational toy is intended for ages 10 and up.

He believes that as a trainer it will help fill the three million computer operation and programming jobs expected by the 1970's.

E.S.R. (for Electronic Systems and Research) had planned to go into production of industrial computers, but the success of Digicomp deferred that activity. The company has added to its line two computer games for children as young as age three.

E.S.R. 34 LABEL STREET, MONTCLAIR, NEW JERSEY 07042

INVENTORS—Dr. William H. Duerig and C. David Hogan consider layout of new game.

Computers for Tots

Budding Einsteins Play With Educated Marbles

By ALBERT M. SKEA

A Montclair physicist also is a moonlighter.

Dr. William H. Duerig is director of general electronics for General Precision's Kearfott Products division in Little Falls.

The 43-year-old scientist also is president of E.S.R. at 34 Label St., Montclair. The company makes toys.

The mechanical toys are different. The operating principles are the same as in a modern electronic digital computer. But the analogy is exact, not simulated or faked.

A three-year-old child can enjoy the games. Older children can go on to perform advanced mathematics, solve riddles, conduct a missile countdown — and program the computer just as is done at data information systems centers.

E.S.R. was founded with computer education in mind. The toys are named Digi-Comp, Think-A-Dot, and Amazing Dr. Nim.

"We had a feeling," Duerig recalls, "that computers, more than any other technology in history, is going to touch the lives of everyone."

The challenge, he said, was to provide some understanding of computer operation, since "people like to know what is affecting them."

Noting the national shortage of computer programmers, Duerig said the aim of the toys is to "expose youngsters early in life to computer principles and perhaps encourage them to go into the field later on."

He added, "At least we can open the door to the field."

$300,000 Sales Seen

The company was founded three years ago by Duerig, along with Irving J. Lieberman, a specialist in advanced computer research, and C. David Hogan of Verona, then a student at Stevens Tech.

Hogan is now vice president and general manager of the company, which has 35 employes. Sales this year are expected to hit $300,000, Duerig predicts.

The first product was a working digital computer, which sells for less than $6.

Museum Tryout

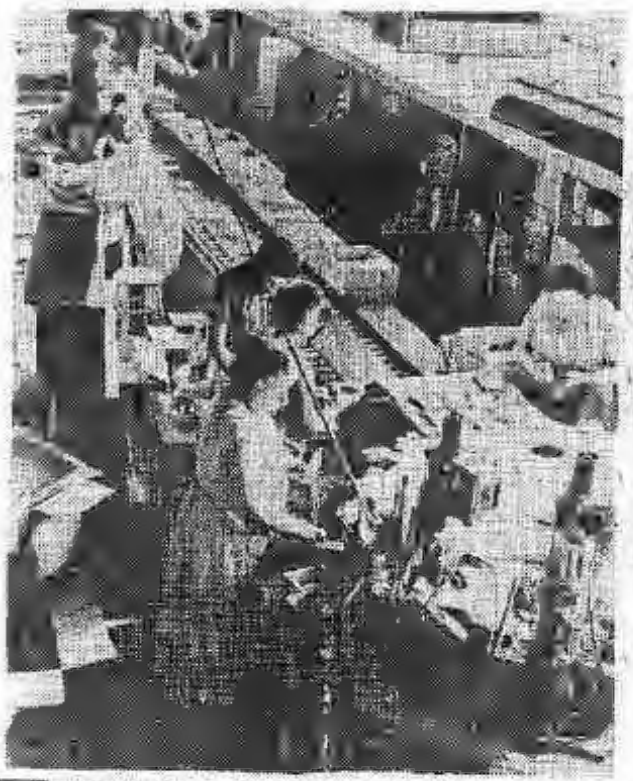
It was "field tested" Saturday mornings at the Brooklyn Museum where children were encouraged to read the instructions and to go on to tackle problems.

Testing later was done at Newark Museum and at the Montclair "Y".

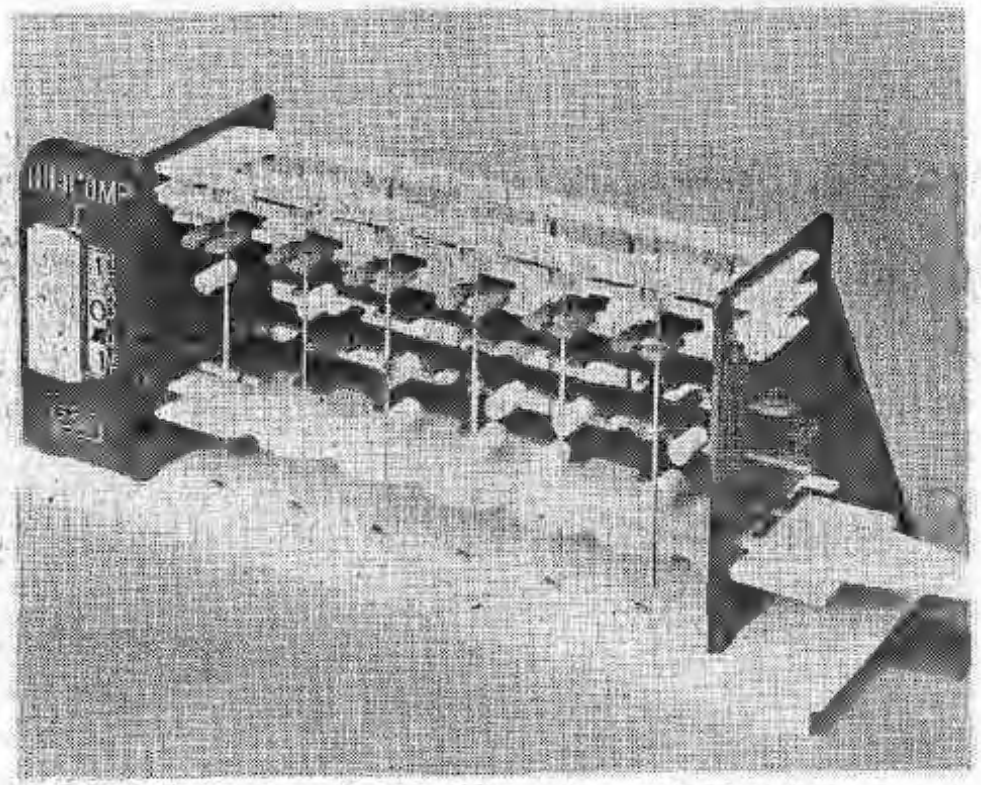
Duerig said he discovered that his own two sons and daughters were not fair judges of the worth of the computer. "They're biased," he explained with a smile.

Duerig and his associates settled on more initials for the company name because nothing more suitable could be found. He now likes to think E.S.R. stands for "education through scientific research."

The company officers also like to joke that E.S.R. has sold more computers than IBM—over



SANTA'S HELPERS—Women assemble plastic computers.



LIKE REAL THING—Computer solves riddles, performs math and can be programmed.

a quarter of a million of them.

In addition to the digital machine, the company is turning out two devices based on computer actions but played with marbles.

(A marble, in effect, duplicates an electron signal in a big computer.)

The appeal is to youngsters, but letters prove the toys are being enjoyed by engineers and scientists, who suggest additional programs which can be inserted into the computer and even come up with ideas for new games.

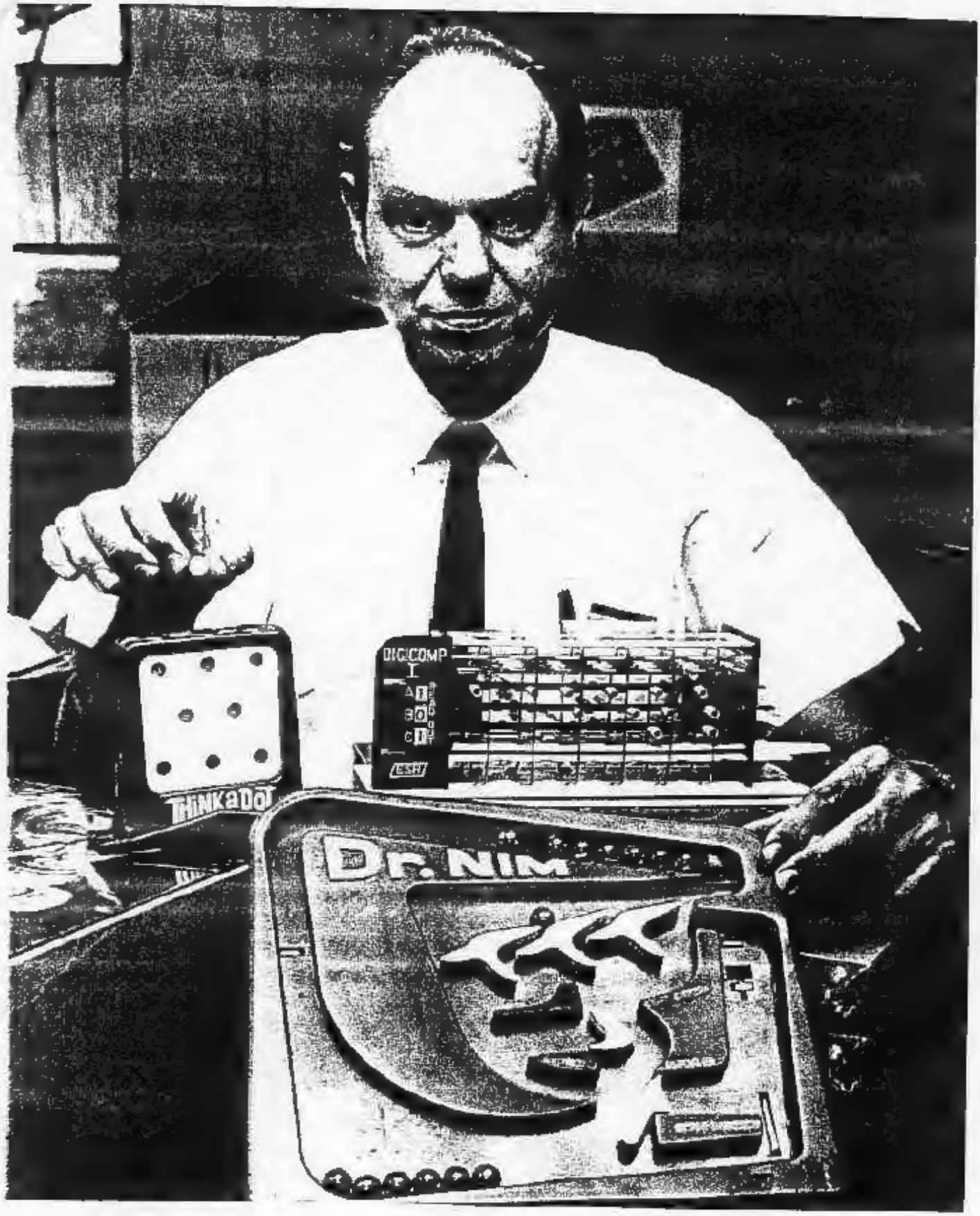
Duerig said he was delighted to receive inquiries whether an instruction book with more advanced problems was available. One was drawn up. Now 20 per cent of all sales are followed by a request for the tougher booklet.

The toy in which the color of eight spots are changed by dropping marbles in three holes to form desired patterns also has a revised booklet.

Average Children

Two 11-year-old boys, somewhat to the embarrassment of the company, wrote that they had discovered how to add and subract with it based on octal arithmetic. These instructions were added to the booklet.

"Adults just don't conceive how smart youngsters are today, how far advanced they are in school," Duerig maintains, while insisting the computer toys were designed with the average child in mind.



1968

several years later when I sought financing for several full-time years to write the detailed history of the early days of personal computing.

The following is taken from the only chapter written for that unpublished history, in which the Scelbi-8H was to have been an important milestone.

First Advertised Personal Computer Using a Microprocessor

The first advertisement for a personal computer based on a microprocessor appeared in the March 1974 issue (p. 154) of *QST*, an amateur radio magazine. The ad was for the Scelbi-8H, manufactured by Scelbi Computer Consulting, Inc., of Milford, CT.

Scelbi's founding father, Nat Wadsworth, was a design engineer with General DataComm Industries in Danbury, CT, when Intel gave a seminar nearby on the 8008 microprocessor. But when he and several other young engineers tried to talk management into simplifying products with the 8008, they got nowhere.

Wadsworth, intrigued by the capabilities of the 8008, cornered several other company engineers and asked, "Why don't we design a nice little computer and each build our own to use at home?" Two of them agreed, and Wadsworth and Robert Findley designed most of the system.

"We had planned on building three computers," Wadsworth said later, "because there were three of us in the initial group. But the work on the first prototype was so exhausting that we decided to lay out actual PC boards and have a small quantity made up. Thus, for about the same amount of time involved, we would have a better quality unit. Also, I think the idea of going commercial had always been in the back of my mind."

Incorporating Scelbi

Wadsworth quit his job in the summer of 1973 to work full time on the computer. Scelbi was incorporated in August; the name stood for Scientific, Electronic, and Biological, "because we saw this computer as capable of going into any of those areas." The full name was never used; legally the company was Scelbi Computer Consulting, Inc. "Most people called it

NELSON WINKLESS

THE FIRST HOME COMPUTER

The complete Digi-Comp I system, including (left of Digi-Comp) a Logic Rod, OR crossbar, two AND crossbars, (below Digi-comp) additional register labels; and manuals.

COMPUTERISTS HAVE ALWAYS ENJOYED ARGUING about which machine was the first true home computer. Claims have been made for the Apple, the Altair, Pet, and others, but the original home computer was a machine called Digi-Comp I, introduced in 1963.

The Digi-Comp I featured a 3-bit register, 6 AND gates (which could be reconfigured as OR gates on a two-for-one basis), and operated without electricity via a hand-operated clock. The price was about $5.00 for the basic machine and Instruction Manual, with an Advanced Programming Manual and a book of 50 additional programs available for a few dollars more.

The documentation provided puts many current offerings to shame. The Instruction Manual introduced binary math, programming theory, and the logical concepts of AND and OR in a series of 15 experiments. The Advanced Programming Manual explained how these experiments were developed using Boolean algebra, Venn diagrams, truth tables, logical equations, and flow charts.

The Digi-Comp I was programmed by placing short tubes on various Logic and Clock rods. Programs available included demonstrations of binary counting and shifting, logical puzzles, and games. Many of these programs were quite impressive.

This little plastic computer was an honorable forerunner of today's technological marvels. It gave many people their first understanding of digital computers and programming, at a time when personal computers were found only in science fiction. ■